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PROGRESS
THE NATIONAL TOOL AND DIE JOURNAL

TOOLS, DIES, JIGS, FIXTURES, MOULDS, GAGES, MACHINES
Design and Engineering
PRECISION SPECIALTIES
STAMPING and PARTS PRODUCTION
Official Publication
Special Tool, Die & Machine Shop Industry

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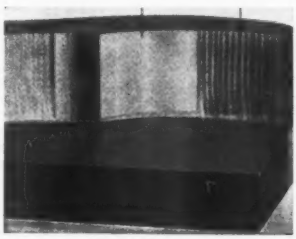

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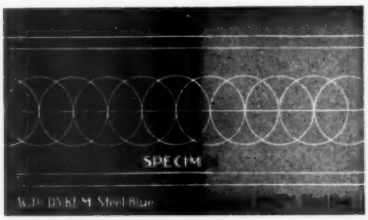

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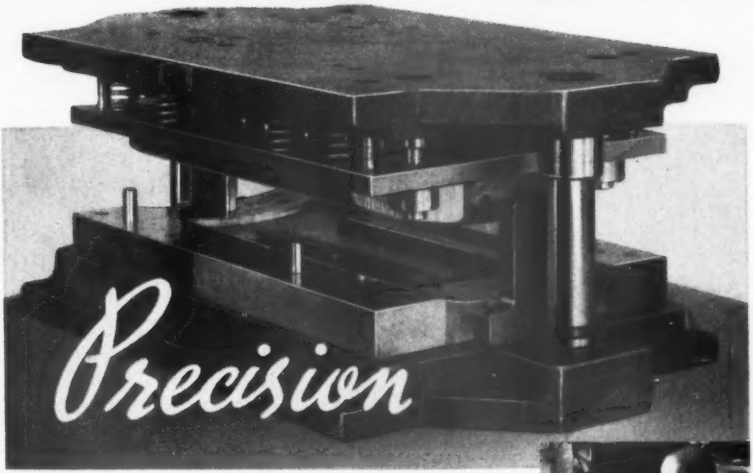

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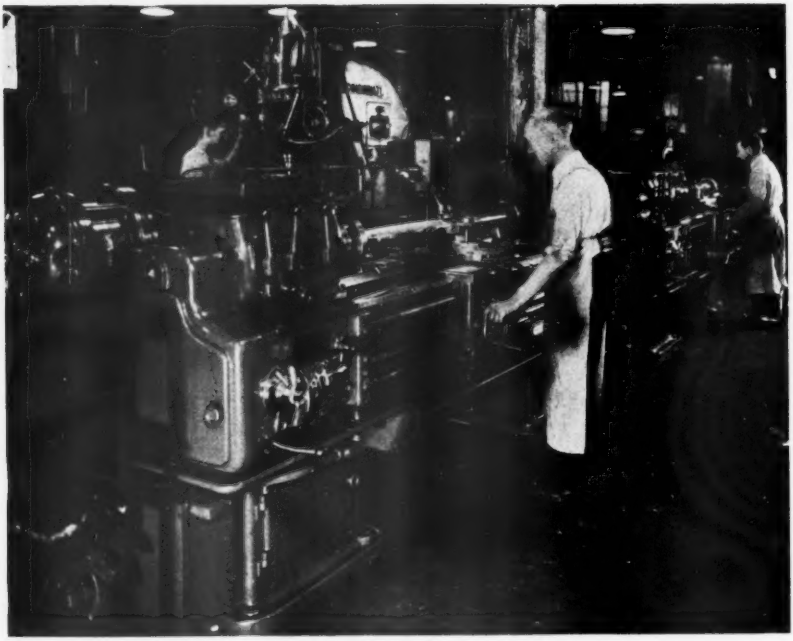

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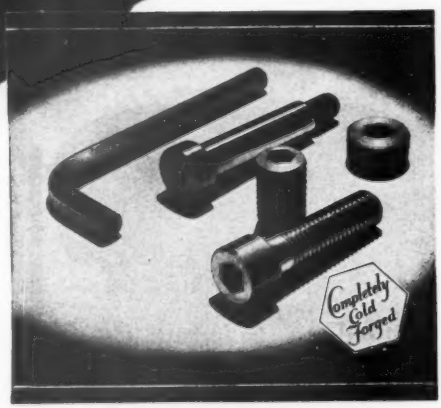

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Tool • Die • Machine **PROGRESS**

The National Tool and Die Journal

October, 1938 Vol. 4, No. 7

You Must Buy, If You Would Sell!

◆

BUSINESS is buying and selling—raw materials, manufactured products and services. The state of the Nation's buying is in direct proportion to the number of such transactions and their gross value. The more times in a given period of time a dollar passes from a buyer to a seller and registers a profit, the better business is.

There is no other way to "reactivate" business except by corporations and individuals becoming buyers. That starts the cycle and gradually in the process buyers are enabled to become sellers. Thus, we believe that you must be willing to buy if you expect to sell.

At this stage of the game, it is buyers we need. With so many unable to buy more than bare necessities, it becomes the obligation of corporations who have surpluses to do judicious buying. If every manufacturer waits for every other manufacturer to begin and in the meantime buys only raw materials and parts to fabricate what he may receive orders for, we are never going to get out of the rut of "repressed" activity. To depend alone upon individuals buying automobiles, refrigerators, radios, wash machines and similar semi-necessities, is not going to do the trick. New machines, new tools, new and improved manufacturing devices and equipment of all sorts—the fundamentals of Industry—must be bought. A machine tool builder who is building an ultra modern piece of precision equipment for tool room or die shop use can hardly expect it to be universally adopted and bought unless he, in turn, modernizes his own tool room with the equipment and tools made by other manufacturers.

We say there are no more frontiers to absorb large quantities of manufactured goods but from our investigation we dare say that if obsolete machine tools and accessories were replaced, shops rearranged according to modern ideas, proper lighting facilities installed and buildings generally renovated, we would have a mighty upward surge of new business. And when terms of payment become a stumbling block between the seller and the buyer it should be possible to work out a method by which some of the millions of idle funds in our banks can be brought into the cycle of "reactivation." If an automobile with a life of five to seven years can be financed on an eighteen or twenty-four months basis for an individual who has no other security, then surely it should be possible to finance the purchase of a machine tool, with its life of twenty to thirty years, over a period of five years for an established business concern.

There is only one way to get business back on its feet and that is for everyone to be able to sell what he has, be it product of farm, mine or factory or his services. And the only way to get that started is for every individual and every business unit to become a buyer to the extent of his or its resources. Then only will they be able to stay in the selling group.

GEORGE J. HUEBNER, *Editor.*

Superfinish — Spectacular New Process for Achieving Surface Perfection

◆ ◆ ◆

By George J. Huebner, Editor

◇ ◇ ◇

A PROCESS and a machine which make it commercially economical to finish a metal surface to a smoothness of one one-millionth of an inch may well bear out the claim that they are the outstanding industrial developments of the year. Superfinishing, as the process is known, was developed by Chrysler production research engineers under the direction of David A. Wallace, president of the Chrysler Division of the Chrysler Corporation, and the machine which does the job is known as the Foster Superfinisher, it having been developed in conjunction with the Foster Machine Company of Elkhart, Indiana.

As illustrated in this article, one of several models is producing bearing surfaces on Plymouth engine crankshafts, which are flawless within six one-millionths of an inch. Superfinishing these crankshaft bearings until they have a surface far smoother than glass, eliminates those microscopic irregularities in the metal which are the direct cause of wear when two such surfaces are in frictional contact. It is these surface defects which develop fatigue failure, in other words wear, and their elimination by Superfinishing creates in their place bearing areas so nearly perfect that it requires microphotography or the ultra-sensitive Profilometer to record their irregularities.

The Profilometer was developed by Dr. E. J. Abbott of the Physicists Research Company of Ann Arbor, Michigan. It was described by George A. Stetson, editor of Mechanical Engineering in his article, "Measuring Surface Quality"—reprinted in Tool·Die·Machine PROGRESS of March, 1938—as a rugged

WHAT IS SUPERFINISH?

Here is the definition as given by D. A. Wallace, President of the Chrysler Division of the Chrysler Corporation under whose supervision this far-reaching new development has been achieved.

"An extremely fine surface finish produced upon flat, internal, external, round, concave, convex, and other types of surface by a combination of short motions, light abrasive pressures, slow abrasive cutting speeds, hard abrasive stones and a lubricant of proper viscosity that eliminates the scratches and surface defects created by previous mechanical operations, without creating scratches or defects."

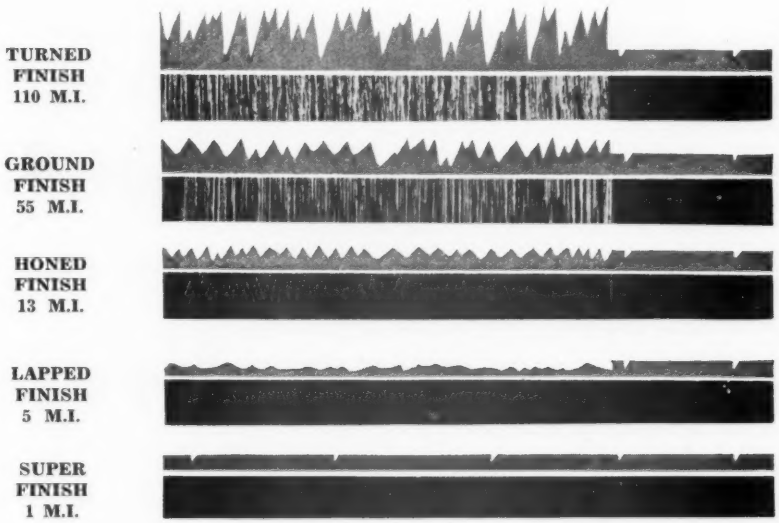
measuring device which makes "records of magnifications of the order of 50,000 X, at which magnification 'a micro-inch is nearly $\frac{1}{16}$ inch on the record and a human hair would be about 15 feet across'."

The micro-inch which was adopted as the yardstick of measurement of this new surface finish designates the degree of roughness, one micro-inch being equivalent to one one-millionth of an inch.

A striking comparison of metal surface conditions resulting from five different methods of finishing is exemplified in the micrographs of the surfaces as we reproduce them herewith. The surfaces were, respectively, turned, ground, honed, lapped and Superfinished. In terms of the Superfinish surface rating of one micro-inch, the turned finish recorded defects to the extent of 110 M.I. The ground finish was greatly improved with irregularities reduced to 55 M.I. Honing produced a surface finish rated at 13 M.I. and lapping came still closer with 5 M.I. Lapping a surface, however, is comparatively an expensive operation because of the time required.

In the experimental work which was done it was developed that a Superfinished surface appears to the eye as a beautiful nickel finish but under the microscope or in a microphotograph it appears black. No scratches remain to reflect light, whereas the bright mirror finish actually indicates a surface which does not reach the base metal and consequently reflects light as the result of minute tool marks. A Superfinish is actually a surface without scratches or at least one with such infinitely minor ones that only microphotographs can reveal them.

A Superfinish surface can be produced upon any material—on flat, taper, round, concave and convex surfaces and either externally or internally. It is achieved, in the definition of D. A. Wallace, by a "combination of short motions, light abrasive pressures, slow abrasive cutting speeds, hard abrasive stones and a lubricant of proper viscosity that eliminates



ONE MICRO-INCH = ONE MILLIONTH INCH.

MICROGRAPHS OF FINISHES BEFORE AND AFTER SUPERFINISH

the scratches and surface defects created by previous mechanical operations, without creating scratches or defects."

To date the Chrysler Corporation and the Foster Machine Company have developed the process and the necessary equipment for use on all of the bearings of crankshafts and camshafts, cams, pistons, brake-shoes, brake-drums, tappet heads, tappet stems, valve stems, flywheel clutch faces, cylinder block line bearings and piston pins. Virtually all of the parts of the engine, and in fact of the entire automobile, which must resist frictional wear are already being Superfinished, or it is expected that they will be. Superfinishing such surfaces is calculated to make them so nearly perfect that with proper lubrication the devices of which they are a part will operate without measurable wear.

The Foster Superfinishing machine which we illustrate is designed for Superfinishing Plymouth engine crankshaft bearings. These bearings require only one previous grinding operation—they need not be finish-ground. Two stones are used on the bearing—one in front of the other. This arrangement has a tendency to correct previous machining errors and it removes decarbonized fuzz, thus leaving a uniformly finished, hard base metal surface. The head of this machine, carrying the Superfinishing arms mounted on a pair of master cranks, is hydraulically operated. Its motion is up and down, away from and toward the working position. The head stock and the master cranks are driven in harmony through spiral bevel gear drives. The head stock spindle is mounted on anti-friction bearings while

Plymouth engine crankshafts come to this Foster Superfinisher with only one previous grinding operation. It requires less than 30 seconds to Superfinish bearing surfaces to an accuracy within six one-millionths of an inch.

the tailstock has a live anti-friction center with adjustable pressure regulator. The hydraulic valves for operating the Superfinishing head and the tailstock are interlocked to prevent operation out of proper sequence. An adjustable timing device regulates the Superfinishing operation, stopping it and automatically raising the head away from the work at the end of a predetermined period. The timing cycle for all bearings is thirty seconds. Compound is distributed to all surfaces which are in process of Superfinishing. Crankshafts are rolled into position to engage driver and centers on rails which are made with stops.

Johansson gage blocks, with their assured accuracy in millionths of an inch, have for years been accepted by industry as the standard of measurement. This new process of commercially Superfinishing a metal surface now brings production parts within the degree of accuracy where they approximate the fineness of Johansson gage blocks. By this process production parts achieve a surface finish whose defects are as little as two-millionths of an inch which for most commercial purposes may be regarded as perfect. One of the remarkable features of Superfinishing undoubtedly is the speed at which it can be done or rather the very brief elapsed time for completing the operation.

Superfinishing will produce its "supersurface" in as little as three seconds, with the outside limit 30 seconds which, of course, is one of the principal contributing factors to its comparatively low cost.

An interesting phenomenon of the operation is that when the cutting stones have brought the surface down to base metal they automatically cease their abrasive action and thus do not create new scratches. This is due largely to the low pressure exerted on the cutting stones as well as the low rate of speed at which they are operated. Also the formation of scratches is averted by the coolant lubricant's viscosity holding the cutting stones away from the finished surface.

Another interesting result of Superfinishing parts' surfaces is the amazing reduction of noise. Tappet heads and camshaft cams which are noisy when finished by the ordinary process, sometimes to the point of being unusable from a practical standpoint, become almost perfectly quiet when Superfinished. The effect of this, as pointed out by Chrysler engineers, is that engines in the 1939 models with their Superfinished parts will eliminate all necessity for the irksome breaking-in process.

The Abbott Profilometer, previously mentioned, is an instrument which uses Cathode rays to reveal the character of a surface—flat, concave or convex. It is a portable instrument possessing a diamond-tipped tracer point which is sufficiently sharp to penetrate the principal irregularities of a surface. It records

Continued on page 27

When these cutting stones have brought the surface down to base metal they automatically cease their abrasive action leaving it Superfinished.

Eliminate Vibration for Accuracy

Inefficiency of Both Men and Machines Results from Unnecessary Vibration and Noise

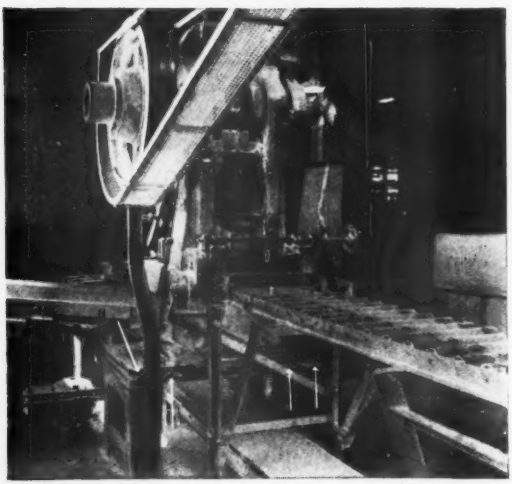
◆ ◆ ◆

By T. S. Rowe
The B. F. Goodrich Company

◆ ◆ ◆

OF special interest to machinery designers, builders and users will be the recent development of the B. F. Goodrich Company's Vibro-Insulators, which cushion impacts, isolate vibration and reduce noise when applied to mechanical equipment. Vibro-Insulators are rubber springs designed usually to carry loads in shear, because this gives them a vibration absorbing capacity greater than when the rubber carries the load in compression. Springs of rubber or metal used to support a vibrating machine will isolate the disturbance by permitting slight movement of the machine without transmission of appreciable vibration through the springs to the foundation. This familiar floating action cushions impacts and vibrations, and reduces transmission of noise. Rubber springs are superior to metal because they do not transmit sound nor oscillate as freely as metal springs.

Vibration is both wasteful and costly. It wears on the hardest and most durable metals as well as on the nerves of workmen and operators. It interferes with the micrometer accuracy so essential in modern processing. It induces



Punch press weighing 5400 lbs. Disturbing frequency (impact type) 150 blows per minute. Mounted on 4—24" lengths of Type 10. Note the "sandwich" made from two plates of ¾" steel, with Vibro-Insulators between. Insulators loaded to approximately 90% of maximum. Results excellent.

noise, discomfort and carelessness.

Noise also is wasteful. Tests conducted by two universities proved that working in noisy places causes tenseness in workers' muscles, unnecessary expenditure of bodily energy, and digestive difficulties. Further tests by one of the large insurance companies showed that elimination of noise increases efficiency, reduces errors, and favorably affects employee turnover and absenteeism.

In order to understand the principle through which Vibro-Insulators cushion impacts, reduce vibration and eliminate noise, it is necessary to consider:

1. The "natural frequency" of the Insulator when loaded with the weight of the machine.

2. The "disturbing frequency" of the vibrations or impacts originating in the machine itself.

This "natural frequency" is the number of vertical movements per minute which occur when the rubber-mounted machine is given a single impulse.

The "disturbing frequency" is the number of cycles of machine operation per minute,—that is to say, the number of revolutions or impacts in the machine to be isolated.

When there is a considerable difference in these frequencies the "disturbing frequencies" are either isolated or cushioned. When the "natural frequency" and the "disturbing frequency" are in step with each other or nearly so, the vibrations are amplified, and this is known as a condition of "resonance." This resonant vibration must be avoided in the application of Vibro-Insulators.

To illustrate: A stationary automobile will rock or move up and down at its natural frequency when it is given a single jolt. Then, if a disturbing force just about in step with the natural frequency is repeatedly applied to the bumper or elsewhere, an amplified motion may be built up, and we then have objectionable "resonance." It is a familiar fact that this effect can be reduced by adding weight to the car,—a heavily loaded car riding more smoothly than the same car with a lighter load. In a similar manner, Vibro-Insulators are most effective when placed under the maximum recommended load.

For effective isolation the lowest frequency of the disturbing machine vibrations should be two and a half times the natural frequency of the loaded insulators. With this ratio of 2½ to 1, only about 20% of the machine vibration is transmitted to the surroundings,—80% of it is isolated. This eliminates practically all noise, and reduces vibration to a point where it ceases to be objectionable.

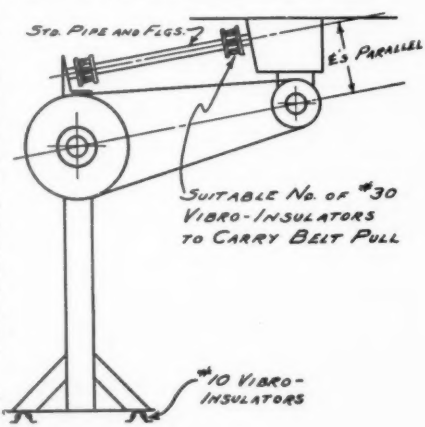
In practice, it is found that all disturbing frequencies of 1000 per minute or more are effectively isolated by the No. 10 Vibro-Insulator when placed under the maximum recommended load.

Where there are low disturbing frequencies, 250 per minute or less, as in punch presses and other impact type machines, the use of the No. 10 insulator at maximum recommended load will cushion the sharp crack of the impact to a dull thud or even to an inaudible vibration.

Reasonably accurate knowledge of the total dead weight of the machine is especially important, to avoid overloading, whereas underloading may develop a resonant condition.

An experimental installation is usually a simple and inexpensive way to determine the practicality of a proposed arrangement.

A booklet of engineering details, formulas and charts written especially for shop engineers and technical men who may desire complete information, is available upon request for Bulletin TD, to the B. F. Goodrich Company, Mechanical Rubber Goods Division, Akron, Ohio.



Die Designing and Estimating

By CHARLES BOHMER

This ninth article continues the series on "Tool Designing and Estimating" as this subject is being taught to Tool and Die Shop apprentices under the auspices of the Chicago District of the Tool-Die-Machine Shop Institute in the Carl Schurz High School. The author, Charles Bohmer, tool superintendent of the Federal Tool Corporation, is one of the class instructors.

Flange Trimming Dies

TRIMMING dies vary considerably in their use and construction, depending on the part under consideration. The purpose of the die may be to trim away excess material on the flange to make possible further forming or drawing, or to obtain a definite contour or size.

Flange trimming of drawn units is a common application, particularly when irregularities of the flange after drawing would be objectionable. Two of the most widely used constructions of dies for this operation are those of the ejection type and those of the drop-through type, each having certain principles that must be closely observed to function properly.

The ejection type is a compound arrangement having the die above and the punch below with a spring stripper or a positive knock-out to remove the part from the die. Accurate gauging is important and is accomplished by means of a block shaped to suit the inside of the shell and mounted in the proper location on the punch.

Freeing the punch of scrap is done in several ways; one, with cutters mounted in the shoe adjacent to the sides of the punch and in locations that will cause the scrap to be free after it is severed. The cutters are "V" shaped and shorter than the punch and as the scrap is forced down against the sharp edges it is cut, giving the desired results. Care must be taken to make them wide enough to cover the width of the scrap. This method requires clearing the shoe of scrap but it is easily followed and very successful.

Another method is by means of a spring stripper that will carry the scrap up. However, if this arrangement is used, blank ejection from the die must be of the knock-out type, otherwise the scrap will be forced back over the flange, making it difficult to dispose of the scrap, possibly distorting the flange if the material is very thin.

Stripping or the ejection of the part from the die must be done in such manner that the pressure is applied in the proper place, usually at the point where the die contacts the part. This is important in obtaining acceptable and uniform results without danger of bending the flange. To do this the knock-out must extend down to the flange having proper clearance for the body of the shell, thus stripping where the pressure is needed. Sometimes spring pressure is needed to hold the flange straight while trimming but the construction is the same. This extended arrangement, however, is not necessary if the material is heavy and the flange narrow, for there will be enough strength in the part to resist the pressure and prevent bending when the shell is forced out,

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therefore the straight conventional plate construction may be used in which the pressure is applied directly on the shell body.

The die must be high enough to permit trimming without crushing. The usual method of obtaining this height is by means of a filler block of some cheaper material upon which the actual hardened tool steel die is mounted—a satisfactory construction resulting in considerable saving of both steel and labor.

The drop-through type of trimming die allows the part to fall through the die, eliminating the necessity for a stripper or knock-out, the only difference being in the mounting and clearance through the shoe. The die is mounted on the shoe and the punch on the holder, the punch having a pilot to give positive location of the shell before trimming. The part is dropped into the die opening with the flange extending over the cut edges and as the punch descends the pilot locates it properly and it is then trimmed and the shell must drop through completely to prevent injury to it from the next one and also to make reloading possible. The scrap sticks to the punch and provision must be made for stripping or cutting it.

Another ejection type of trimming die is that in which the punch is shaped out to fit the outside of the body of the shell and the cutting edge to suit the trimming contour. It is mounted below on the shoe, and the die above the shell is dropped in open-side up with the flange extending beyond the edges for trimming. All provisions for ejection and scrap removing must be made as in the other ejection type of die. This construction is only practical for shells having large flanges and it has a very limited field of application for this reason.

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Karl Harig Elected for Third Term By Chicago District

Bruce Krasberg, Karl Harig, Wm. M. Phares, Carl Danielson

A WELL attended annual meeting of the Chicago Division of the Special Tool, Die and Machine Shop Institute was held on September 15, at the Midwestern Athletic Club. The esteem in which Karl Harig is held by members of the Chicago group was attested when the nominating committee reported that it had named him for a third term as president. Mr. Harig declined with the plea that the precedent of not more than two years in office should not be broken. When members present elected him unanimously by acclamation there seemed no alternative and Karl was duly declared president for a third term. Mr. Harig is president of the Harig Manufacturing Company.

Other officers elected were: vice-president, Bruce Krasberg, president of Krasberg and Sons Manufacturing Company; treasurer, Carl Danielson, president of Service Tool and Die Manufacturing Company; secretary, William M. Phares. M. P. Heinze, president, M. P. Heinze Machine Company; Miles Irmis, president, Superior Tool & Stamping Company; Franz Krag, president, Krag-Martin Corporation and E. W. Fritzell, owner, Phoenix Tool and Manufacturing Company, together with Messrs. Harig, Krasberg and Danielson, comprise the Board of Directors for the coming year.

President Harig reported on the condition of the association and its activities during the preceding year. The outstanding accomplishment of the association was the success of the campaign to defeat Illinois House Bill 28 which proposed to "levy a tax of 3% on the gross receipts of all producers of tangible personal property of no use or value to anyone other than the person or persons ordering same."

The evening classes in "Die Designing and Estimating," sponsored by the Chicago group and being conducted in the Carl Schurz High School, were reported to be continually increasing in popularity and to be covering an ever widening field under the able instructorship of Charles Bohmer.

In spite of the periodically adverse business conditions during the year, Mr. Harig stated that satisfactory membership and financial conditions had been maintained. Sport and social activities are an important part of the Chicago District's curriculum. Two golf tournament attendance records were broken; a twelve team bowling league made up of members entirely within the organization has a waiting list; the annual dinner dance was the social high spot of the year.

Among plans for the ensuing year a program was announced by the Secretary to reduce members' contributions to the Unemployment Compensation Tax through their closer co-operation in the stabilization of employment.

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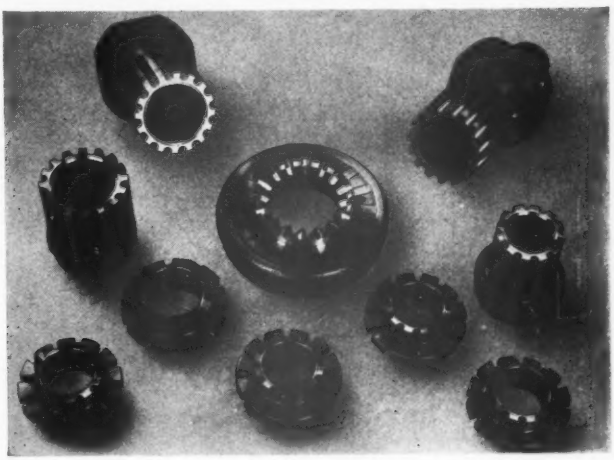

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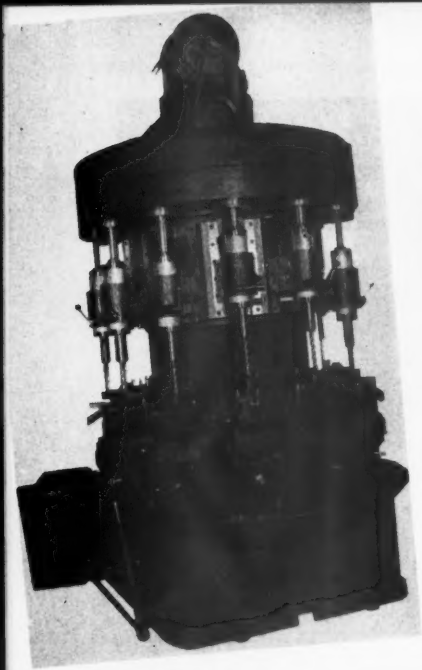

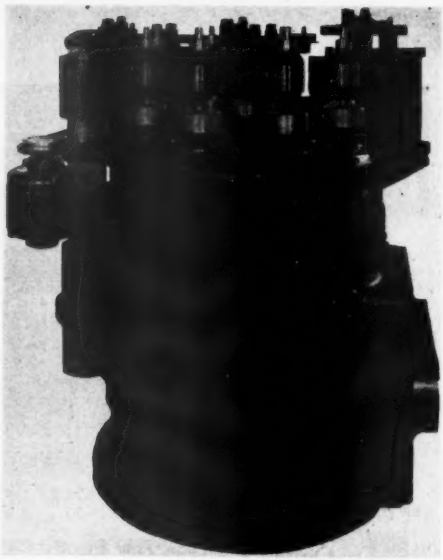

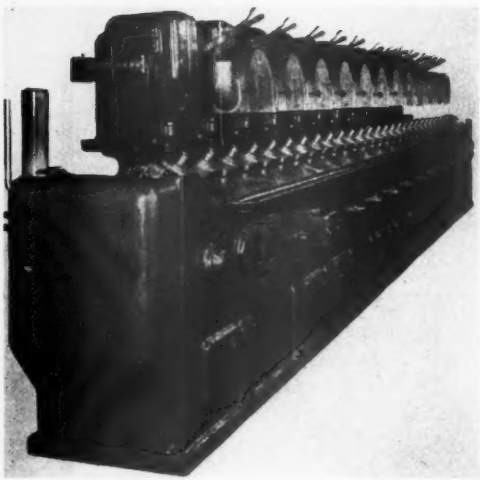

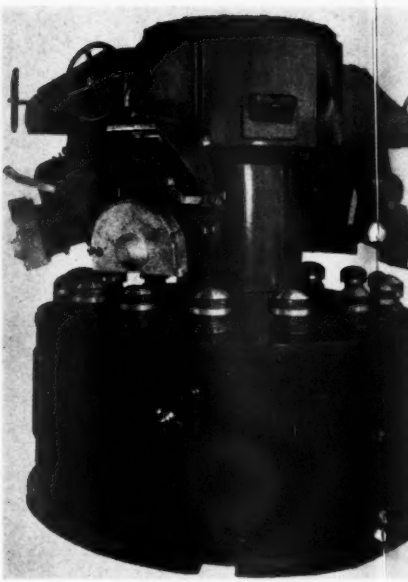

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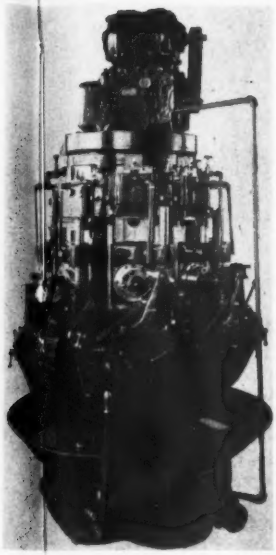

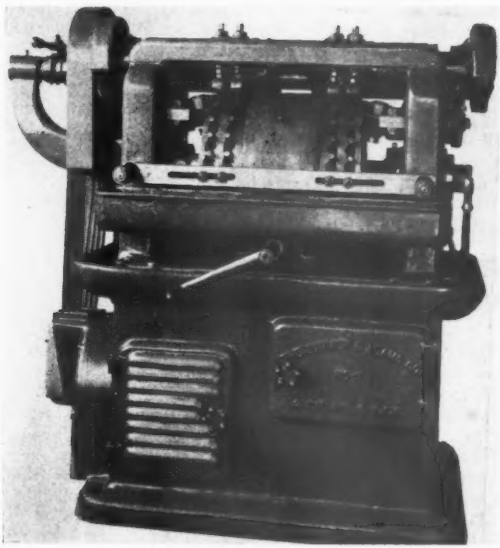

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Even a Drill Point Can Be Expensive

By R. J. Sack
Oliver Instrument Company

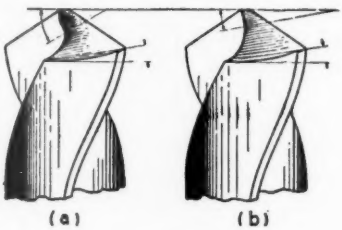
THIRTY operations are said to be required to change a bar of high speed steel into a finished twist drill and that most of them require a high degree of skill and precision. These thirty careful operations are necessary to provide a cutting edge on the end of the drill which will permit it to cut its way into solid metal, therefore it is highly important that this cutting edge be ground and reground with the utmost precision and with a form which will offer the least possible resistance to the removal of metal.

Drill manufacturers universally contend that greater care should be used in the grinding of twist drills. Hand grinding should be avoided as much as possible because the failure to obtain proper clearance angles may cause drills to split. Maximum efficiency in the use of drills is assured only when points are ground correctly. Poorly sharpened drills dull quickly, drill slowly, impose undue strain on both drills and drilling equipment and may be generally put down as inefficient.

Unnecessary wear and consequently frequent replacements are traceable in most instances to what is known as the ordinary form of point which has little or no clearance toward the center of the drill. The effect of this upon a drilling machine is to require heavy feeding pressure with possibility of strain and machine breakage. This is particularly true on the multiple spindle type where the combined pressure required to force the drills into a work-piece represents a heavy load. In such instances the power required naturally increases, resulting in a drilling operation that is more costly than is necessary.

The machine grinding of drills is one of those operations which, when all factors are taken into consideration, including a sufficient volume of drilling, readily pays for the machine which is required. There is no question about it in mass production and where multiple spindle drilling machines are used.

More than 15 years ago our company developed what has since become known as the Oliver Point. In the development of the machines to create this point users of twist drills have become increasingly familiar with it and they as well as twist drill manufacturers have acknowledged its advantages. The Oliver Point is one in which the angle of clearance increases rapidly as the web or center of the drill is approached. This clearance may be varied to suit the requirements of the job. It has been referred to as "the theoretically correct drill point."



In the illustration "a" is an exaggerated view of the Oliver Point; compare this with "b," an ordinary point with its practically constant angle of clearance. As in the manufacture of interchangeable parts, equipment for accurate fabrication had to be developed, so absolutely uniform drill sharpening is assured only from the use of drill pointing machines. And it is natural to assume that an Oliver Point is possible only from the use of an Oliver Drill Pointer.

All of its motions for grinding a drill are automatic, the result of fixed mechanisms. An oscillating motion carries the wheel across the cutting angle of the

The new Oliver of Adrian No. 510 Drill Pointer covers the entire line of drill sizes from ¼" to 3", 2, 3 or 4 lip drills.

drill. At the same time the grinding wheel is also advanced toward the drill as the drill revolves, the result being the generation of a clearance the angle of which increases toward the center.

The form of the Oliver Point is controlled by a master cam which, by means of a simple adjustment, may be varied to produce the proper clearance and the form best suited for the material for which the drill is being prepared. It is possible to lock the cam in position, which insures continued reproduction of the same drill point. Adjustment for all point angles from 82° to 160° is possible.

Catalog describing the new Oliver Drill Pointer referred to in this article is available to those interested. Write Oliver Instrument Company, Department PR, Adrian, Michigan.

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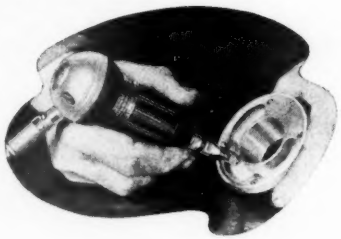
Air Turbine Grinder

THE Onsrud air turbine grinder recently developed has a spindle speed of 75,000 RPM. It weighs only 12 ounces but carries an actual rating of 1/6 HP.



The new grinder was designed particularly for tool and die grinding and to be used as a marking tool for writing on all types of metals, plastics, glass, porcelain and other materials. Its exceptionally high spindle speed and power are set to assure a smooth high finish in grinding operations.

The grinder may be used in any position, including mounting into a lathe tool post holder for internal grinding and placing in a vise for tool resharpening. Precision ball bearings, automatic lubrication and use of expanded exhaust air as a coolant are a few of the important features. The rotor is made of nickel steel and is integral with the spindle. It is claimed that the grinder cannot be heated by overloading and operates continuously at less than room temperature.

Further details may be had by writing Department TD, Onsrud Machine Works, Inc., 3910 Palmer Street, Chicago, Ill.

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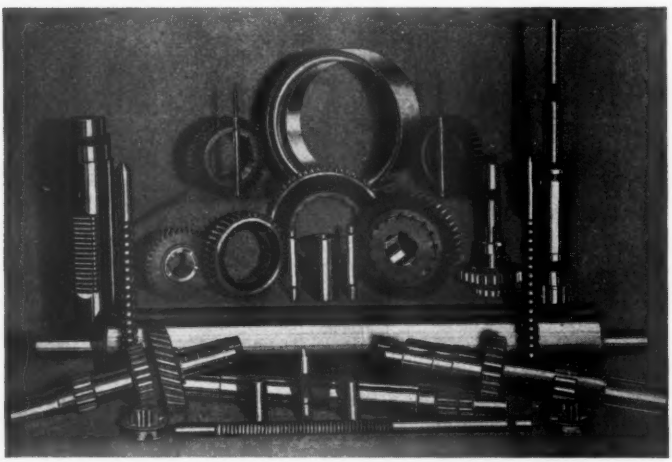

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New Interchangeable Type Holder For Name Plate Marking

A NEW style interchangeable type holder has been developed by H. O. Bates, manufacturer of all types of numbering machines and marking devices. With the ordinary practice of hand stamping letters and numbers in name plates and parts, it is often difficult to maintain a straight line. However by the use of the "Hercules" type holder either type or logotype and dies are held in place to insure correct alignment. Each character has a notched side so that when it has been inserted into the holder a unique clamping device which fits into the notch holds the type securely. Holders for curved line stamping are also available.

An arbor press for use with the holder has also been developed. The ram on the press is square to insure parallel line stamping. The leverage ratio is 50 to 1 and is capable of applying 4 tons pressure. The arbor base has a spotted gauge for line spacing on name plates and parts. The type holder is held in the ram by means of a set screw on the front of the ram. Type or dies may be inserted or removed without removing the holder. For more complete information write for Bulletin MP to H. O. Bates, 66 Barclay Street, New York, N. Y.

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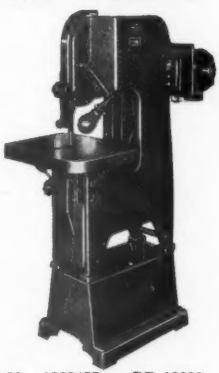
Write for detailed catalog giving full information on above as well as on other continuous motion filing machines, Metal Cutting Band Saws and Open End Band Saws.



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Class in Practical Die Designing Begins Fall Term

THE new Fall class in die designing at the Cleveland Trade School is now being formed and as in previous years is under the direction of Ralph A. Wagner, chief die designer, Truscon Steel Company. The purpose of this course is to train men for die designing positions and to improve those who are now employed in die shops and stamping plants. Primarily the course deals with blank developments, reductions in forming cups, and designing blanking, forming, drawing and piercing dies.

This course has been offered for the past three years by the Cleveland School Board and is open to all men over 18 years of age, with at least elementary drawing experience, and whose work is related to this subject. Classes will meet for a period of 15 weeks from 6:30 to 10 P.M. and students may register for either Wednesday or Thursday night classes. The fee is $5.00 for residents of Cleveland and $10.00 for non-residents, however, 60% of this fee will be returned to those attending 12 of the 15 meetings.

If interested write the Cleveland Trade School, 535 Eagle Ave., Cleveland, Ohio, or telephone CHerry 7430.

Do-All Opens New Eastern Sales Office

ANNOUNCEMENT of a new eastern territory sales office and display room at 119 Lafayette Street, New York City, is made by Continental Machine Spec., Inc., manufacturers of the Do-All contour sawing and filing machines. Operation of the new office will be under the management of D. A. Moreinis; under his direction are J. M. Dillon, New England territory, L. A. Peirez, New York City, and M. A. Singer, Philadelphia representative. The Do-All band filer and the contour sawing machine may be seen in operation at this new showroom.

Cleveland Small Shop Site For Sale

Unusually suitable lot for Tool and Die shop, precision manufacturing plant or stock depot and office. Has abundance of permanent light on three sides. Located midway between East and West industrial districts. Convenient to supply houses. Size 59 feet x -25 feet and priced right. Write Box 20, TDM PROGRESS, 215 Fairmount-Cedar Bldg., Cleveland, Ohio.

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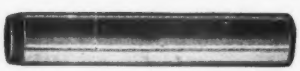

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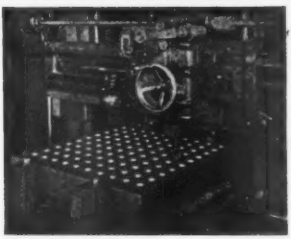
Superfinish

Concluded from page 13

surface profile irregularities to the extreme of one one-millionth of an inch (.000001 in.) although it is also practical for use when the surface roughness condition reaches one one-thousandth of an inch (.001 in.) The instrument traces a profile rapidly, so quickly and easily in fact that it is practical for inspection in high production.

Another interesting feature about the Superfinishing process is that it produces not only a finer surface but it does it day after day with little or no variation in its degree of smoothness. Comparatively low cost abrasive sticks or stones are used and their use-life spreads over many individual parts. Stone changing is a simple operation in the Superfinisher.

These are some of the facts which make Superfinishing the outstanding industrial development of the year.



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The Catalog Review

Brief descriptions of current industrial literature including technical booklets and bulletins, catalogs and circulars. All may be had upon request, without charge. . . . Please use identification numbers.

BALL AND ROLLER BEARINGS, TRANSMISSION UNITS.—A new catalog describing and illustrating diagrammatically ball, ball thrust and roller bearings made by Fafnir, New Departure, Norma-Hoffman, Obb and SKF; American, Hyatt, McGill and Torrington; Rollway and Timken. Series and types are carefully listed with their dimensional and construction characteristics. There are plate and seal types, double row, cartridge, matched duplex, self-aligning, grease shield and angular contact ball bearings. Unusual care has been used in pointing out particular advantages to be derived from the use of each type of bearing and it is continually emphasized throughout that "bearings twice as large, last ten times as long." An entire section of the catalog is devoted to power transmission units, including pillow blocks, motor cartridges, line shaft boxes, fan and blower boxes. A miscellaneous section describes and lists sizes and types of bearing-housing covers, oil retainers and oil seals. Much technical data of value to design and production engineers and builders of special machines and equipment are included. For a copy of this catalog write The Ohio Ball Bearing Company, 6531 Euclid Avenue, Cleveland, Ohio, for TD-801.

HAND AND MACHINE FILES.—Just "as the alligator bites, so does a Carson-Newton file" according to this new catalog of Alligator Swiss and American pattern files. Die makers will be particularly interested in the large variety of die sinker files and riffler. The files are illustrated in twelve shapes and are 3½" long, exclusive of the tang. Eighteen shapes of the die sinker riffler files are illustrated and described. They are available in 6, 6½ and 7 inch lengths and are usually designated as small, medium and large. Filing machine files are available in two diameters, ⅛" (Type B) and ¼" (Type A), but are made in only one length 3¼" over all. A comparison of the cuts of the Swiss pattern files with those of the American pattern files is included. Hundreds of other shapes and styles of files are also illustrated and described. Write Carson-Newton Company, 61-71 Mill Street, Bellevile, New Jersey, for TD-802.

MICROMETER DIAL GAUGES AND PRECISION MEASURING INSTRUMENTS.—A catalog which gives special attention to the exclusive features of the Ames Shockless Gauge: shock absorbing wheel assembly; removable case stem and spindle; no screw point; wire-attached bezel; finger-fit crystal; solid steel back; short spindle with coarse rack; cup dial and straight line hand; no spring under dial. Others include small diameter and standardized types; long range indicators and models indicating tenths of thousandths; upright gauges, thickness measures, cylinder gauges, pocket gauges and dial micrometers are illustrated and described in detail. Universal surface gauge mount has countless uses in tool and die shops and departments—large and small. It is valuable for testing trueness of parts chucked in lathes, testing accuracy of setups and cuts on planers, millers, shapers and drills as well as flatness, roundness or straightness of parts being ground. This interesting 36 page catalog is available by writing B. C. Ames Company, Waltham, Massachusetts, for TD-803.

NO. 16 POWER FEED DRILL.—A new bulletin describing and illustrating the No. 16 power feed drill with features recommended by tool and die shop and production engineers. They include a positive feed requiring no adjustment, fully geared feed "take-off," depth control set and depth dial reading from the front of machine, and possible feed change while the machine is running. All high speed bearings are double row precision type and those for slow speed are bronze bushed. The worm is hardened gear steel and runs in bronze bushings with the thrust taken on a ball thrust bearing. Positive drive clutch members are made from hardened chrome nickel alloy steel. Helical high speed reduction gears are used, designed right and left hand to equalize thrust. Line drawings of the construction and design of this new power feed are included together with complete specifications and capacities. Write Buffalo Forge Company, Buffalo, N. Y., for TD-804.

FRICTION CLUTCH FOR PUNCH PRESSES.—A folder which summarizes the principal advantages of the Servo-action punch press clutch as a large increase in production per hour, particularly in blanking where the nature of the die does not limit the press speed; a reduction of the expense for repairs and down time; a smooth, easy operation which is less tiring to operators. Illustrations and technical description of the Servo-mechanism is included. Write Industrial Clutch Company, Waukesha, Wisconsin, for TD-805.

DIE MILLING MACHINE.—A bulletin describing and illustrating the new Johnson die milling machine designed for rapid and accurate milling of blanking, trimming and punching dies. Two spindles, one below the vise table and the other mounted in a head fastened to the column of the machine which can be swung out of position when not in use; doublesealed, greased-for-life ball bearings; positive, but flexible, noiseless V-belt drive allowing four spindle speeds ranging from 400 to 1700 R.P.M. are the outstanding features described. Specifications and additional accessories are also included. Of particular interest to die builders. Write Johnson Tool Company, Inc., East Providence, Rhode Island, for TD-806.

PRECISION BENCH LATHE.—A bulletin describing new integral drive precision bench lathe, with built-in motor and speed-changing mechanism, entirely eliminating millwrighting. The integral drive is described as consisting of a ball bearing ½ h.p. motor driving through a disc clutch and variable V-belt sheaves, and through V-belts to the headstock, giving any speed between 156 and 2200 r.p.m. in the Standard Model or between 300 and 3000 r.p.m. in the High Speed Model. Speeds can be instantly changed through a conveniently located hand wheel and registered on indicator mounted on switch column. Models are available in ¾" and 1" collet capacity with 9" swing and 40" bed. Other specifications are included. Write Stark Tool Company, Waltham, Massachusetts, for TD-807.

INDEPENDENT, SELF-CENTERING AND COMBINATION CHUCKS.—An interesting bulletin which has been prepared for chuck users whose requirements fall within the range of the following types: 4-jaw independent chucks; 3-jaw and 4-jaw self-centering chucks; 3-jaw and 4-jaw combination chucks. These may easily be called the essential chucks of the metal working industries and a condensed listing of sizes and prices is included as well as standard jaw equipment and mountings for the old and new type spindle noses. Chucking equipment for use on milling machines, lathes, grinding machines and boring mills is described and illustrated. Write The Cushman Chuck Company, Hartford, Connecticut, for TD-808.

BENCH MILLING MACHINE AND JIG BORER.—A circular describing the Linley high speed vertical bench milling machine and jig borer which has been designed for small work such as dies, jigs, fixtures, model work, molds for plastics, and all other types of work on laying out, drilling, milling and boring operations. The machine is well illustrated and special attention is given to describing its numerous features including the compound table assembly, the chrome nickel steel spindle, bearings and assembly, the new micrometer screw feed head, and heavy duty V-belt reversible drive. Complete specifications are included. Write Linley Brothers Company, 18 Montauk Street, Bridgeport, Connecticut, for TD-809.

HIGH SPEED MILLING ATTACHMENT.—A catalog which describes the Bridgeport High Speed Milling Attachment as having an unlimited field. Equally indispensable for boring, milling and drilling in the small tool shop as in the largest shop of the automotive, electrical and machine tool industries. The attachment is illustrated in three sizes. A few of the basic features discussed include a chrome nickel alloy heat treated and ground spindle with precision preloaded ball bearings properly spaced for maximum radial and thrust capacity; an aluminum canopy protecting the motor from dirt and containing a reversible switch for right and left hand operation; design which makes it possible to mount on the front or on either side of the overarm of the milling machine. Write The Bridgeport Pattern and Model Works, 52 Remer Street, Bridgeport, Connecticut, for TD-810.

TOOL AND DIE STEELS.—A series of four interesting bulletins describing the properties and uses of "Swed-Oil," "Hi-Run," "D-C-33" and "D-C-66" tool steels. "Swed-Oil" is an oil hardening steel alloyed with Manganese, Chromium and Tungsten. Its deep hardening qualities together with its non-changing and non-warping characteristics make this steel especially adaptable for molding, blanking, cutting, drawing, forming, pressing, stamping, trimming, and lamination dies, cutting tools and gages. "Hi-Run" is a high chrome, high carbon production steel. It is well annealed and is readily machinable. "Hi-Run" is an air and oil hardening steel that holds its shape in hardening, offering unusual resistance to wear, corrosion, chipping and crumbling and is recommended for tools and dies for swedging, pressing, coining, shearing and compressing operations. "D-C-33" hot work steel is a low carbon chrome-silicon-tungsten-molybdenum steel for tools and dies on upsetting machines, presses and hammers handling heavy work. "D-C-66," a chrome tungsten vanadium hot work chrome-tungsten-vanadium hot work steel which resembles a high speed steel in its properties is recommended for tools and dies, particularly where high temperatures are a working factor. General heat treatment instructions for forging, annealing, hardening and tempering for each of the various tool and die steels, together with illustrations of representative applications are included. Write The Kloster Steel Corporation, 222 North Justine Street, Chicago, Illinois, for TD-811.

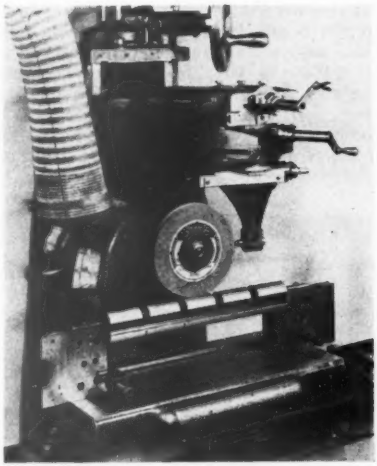
HELICAL REAMERS AND END MILLS.—A catalog describing and illustrating all types of reamers and end mills, including the original helical taper pin reamer designed by the late William B. Gammons, tool maker, inventor and manufacturer, duplex hand taper pin reamer and die makers taper reamer. The taper is ¼" per foot or .0208" per inch. The reamers are arranged so that each size overlaps the next size smaller. The die makers taper reamer is made with the taper which gives the correct clearance in piercing dies and can also be used as a milling cutter for profiling. The helical end mills are described as having a right-hand cutting end and a left-hand helix to cut when rotating right-handed or with left-hand cutting end with right-hand helix to cut when rotating left-handed. Illustrations and complete specifications are included. Write The Gammons-Holman Company, Manchester, Connecticut, for TD-812.

GAS-O-GRAPH FLAME CUTTING MACHINE.—A new circular describing and illustrating the new Cig Automatic Gas-O-Graph for the automatic mechanical flame cutting of all types of shapes from plates and billets. With a range of thirty inches in width and unlimited length, this new machine can cut any type of shape from a tracing, template or pattern, and more than one torch can be used when multiple cuts are desired. This machine provides an unusually low cost method for flame cutting wherever special or intricate shapes are required. It permits of the use of high strength and low cost rolled steel where expensive castings were formerly required. Several flame cut welded assemblies and parts for large machine tools are illustrated. Fabrication cost reduction, simple construction and easy operation, are a few of the numerous features discussed. Write Compressed Industrial Gases, Inc., 221 North La Salle Street, Chicago, Illinois, for TD-813.

Compound Wheel-Truing Attachment Designed for Permanent Column Mounting

THERE are innumerable instances where a grinding wheel dressing attachment permanently mounted on the grinder spindle column can be a means of saving much valuable time. Such a device is the new Compound Wheel-Truing Attachment, announcement of which is now being made for the first time by the U. S. Tool Company, Inc.

In Tool Rooms and Tool & Die Shops, in fact wherever form grinding is being done, wheel-truing is necessary and the value of having a dresser in position to use quickly and easily, without disturbing the work on the grinder table, is apparent. This new U. S. Wheel-Truing Attachment is said to be the only one with which this is possible.



Any desired angular or radial form can be easily dressed on a wheel with this attachment. Combination of radial and angular forms are blended with one another to give a continuous form surface. The three adjustable slides on the unit permit truing of any shape and the scope of application is only limited by the ingenuity of the operator. Since all of the adjustments are furnished with scales the settings used in obtaining any form may be recorded and the exact form duplicated at any future time. Another important feature of the U. S. Wheel-Truing Attachment is the simplicity of adjusting the diamond to position with a gage. When not in use the attachment is entirely out of the way and does not interfere with the normal work of the grinder.

On intricate form grinding, time-savings of as much as 80% have been established, due primarily to the fact that in form grinding the time required for wheel-truing is frequently more than the actual grinding time.

For method of operation and price of attachment, write for Circular CL to U. S. Tool Company, Inc., Ampere, East Orange, New Jersey.

CONTINENTAL BAND FILER

A new, efficient bench model for rapid, internal and external band filing, 32" high. Weighs 150 lbs.

Let us prove its worth. A factory-trained man will bring a machine to your plant and show you exactly what it does, what it saves, on your own work.

Circular on Request

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303 S. Washington Ave. Minneapolis, Minn.

CARING FOR TOOLS *Pays!*

Systematic Care of tools pays the employer in increased production. The men will do more work and do it more easily when they care for their tools in a *Gerstner* Chest. The choice of particular men for 30 years. *Free Catalog.*

GERSTNER TOOL CHESTS
56 Columbia St., Dayton, Ohio

When you order or write about products described in TDM PROGRESS please mention the publication.

Dayton Rogers Offers New Weight Calculator

A POCKET size slide rule for flat materials, that will give the correct weight instantly of steel, aluminum, cast iron, copper, bronze and lead, in widths from ⅛" to 96"; in thicknesses from .002" to 25"; in lengths from 1 inch to 1000 feet, and in weights from .1 to 10,000 pounds, is being offered free to purchasing agents, engineers, estimators, stamping supervisors and others

requiring the weights of different flat metals. This little pocket slide rule is a very convenient calculator. Write Department PG, Dayton Rogers Mfg. Co., Minneapolis, Minnesota.

Conner Goes to Europe

KIRKE W. CONNOR, President of the Micromatic Hone Corporation, Detroit, sailed October 6 for a European trip. He plans to visit England, France, Holland, Germany, Sweden and Russia, returning in six or eight weeks with data on foreign methods of surface finishing of interest to design, engineering and production officials in the aircraft, automobile and ordnance manufacturing industries.

IN the sixteen years since the birth of the radio industry 45,000,000 sets have been sold. Their value is estimated at $6,500,000,000. As reported by Radio Today, there are now 37,000,000 radio sets in use in the United States which is equivalent to one for every three and one-half persons. We do not have the "wordage" volume which has come through these receiving sets but it would probably be a good bet that it exceeds each year the total sales volume in the industry since it has been in existence.

Hamilton, Ohio

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220-222 North B Street
Designers and Builders of
Tools, Dies, Jigs, Fixtures, Special Machinery
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THE OVERLY-HAUTZ CO.
1617 West 116th St. LAkewood 3640
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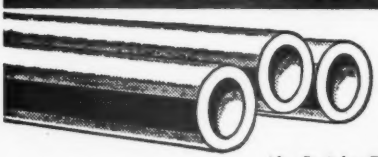
OIL HARDENING TOOL STEEL TUBING



Substantially reduces labor costs by eliminating the expensive procedure of drilling from the solid.
BISCO TOOL STEEL TUBING is a fine grade tool steel in tubular form available in sizes up to 14" diameter and 2" wall thickness; other sizes to your specification.
THE BISSETT STEEL COMPANY
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Also Stainless Tubes, Mechanical Tubes, Aircraft Tubes, Pressure Tubes

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Forging and Casting Corp., Ferndale (Detroit), Michigan.

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Ohio Ball Bearing Co., 6531 Euclid Avenue, Cleveland, Ohio.

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McKinney Tool & Mfg. Co., The, 1688 Arabella Rd., Cleveland, Ohio.

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Buffalo Forge Co., 477 Broadway, Buffalo, N. Y.

BOLTS—Stripper
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.

BORING HEAD
F. A. Maxwell Co., 310 Broadway, Bedford, Ohio.
Precision Tool Co., Bridgeport, Conn.

BUSHINGS—Die
Acme Industrial Co., 206 No. Laflin St., Chicago, Ill.
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.

BUSHINGS—Drill Jig
Acme Industrial Co., 206 No. Laflin St., Chicago, Ill.
Colonial Bushings, Inc., 147 Jos. Campau Ave., Detroit, Mich.

CASTINGS— Nitri-Cast-Iron, Air and Oil Hardening Tool Steel Cast to Shape
Forgings & Casting Corp., The, Ferndale (Detroit), Mich.

CASTINGS—Strenes Alloy
Advance Foundry Co., 100 Parnell Ave., Dayton, Ohio.

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Master Chrome Service, Inc., 5611 Herman Ave., N.W., Cleveland, Ohio.

CLAMPS—Die
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Detroit Stamping Co., 3443 West Fort St., Detroit, Mich.

COMPARATOR
The Webber Gage Co., 2517 Vestry Ave., Cleveland, Ohio.

CONTOUR METAL-WORKING MACHINES
Continental Machine Specialties, 1301 S. Washington Ave., Minneapolis, Minn.

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Putnam Tool Co., 2985 Charlevoix Ave., Detroit, Mich.

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Enterprise Machine Parts Corp., 2721 Jerome Ave., Detroit, Mich.

CUT-OFF WHEELS
Carborundum Co., Niagara Falls, N. Y.

CUTTERS—Milling
Putnam Tool Co., 2985 Charlevoix, Detroit, Mich.
Weldon Tool Co., The, 3000 Woodhill Rd., Cleveland, Ohio.

CUTTER GRINDERS—Universal and Standard
H. P. Preis Engraving Machine Co., 155-157 Summit St., Newark, N. J.

CUTTING MACHINES—Hand & Power
Buffalo Forge Co., 477 Broadway, Buffalo, N. Y.

● This directory of products lists for ready reference the names of manufacturers and dealers whose sales to Tool·Die·Machine PROGRESS readers have established them as dependable in every sense of the word. They merit your consideration.

● Complete information about any product may be had upon request made to the firm listed or to us.

● Your mention of Tool·Die·Machine PROGRESS will be appreciated.

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Carborundum Co., Niagara Falls, N. Y.

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Acme Industrial Co., 206 No. Laflin St., Chicago, Ill.
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.

DIE MAKING MACHINES
Continental Machine Specialties, Inc., 1301 Wash. Ave., Minneapolis, Minn.
Grob Brothers, Grafton, Wis.

DIE AND MOLD COPYING MACHINES—Three Dimensional
H. P. Preis Engraving Machine Co., 155-157 Summit St., Newark, N. J.

DIE SECTIONS—Composite Steel
Forging and Casting Corp., Ferndale (Detroit), Michigan.

DIE SECTIONS—Forged
Ajax Steel and Forge Co., 205 Adair St., Detroit, Mich.

DIE SETS
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.

DOWEL PINS
Acme Industrial Co., 206 No. Laflin St., Chicago, Ill.
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.

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Carborundum Co., Niagara Falls, N. Y.

DRILL—Portable Electric
Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago, Ill.

DRILLING MACHINES—Automatic
Sommer & Adams Co., The, 18511 Euclid Ave., Cleveland, Ohio.

DRILL JIG—Universal
Hartford Special Machinery Co., Hartford, Conn.

DRILL JIG BUSHINGS
Acme Industrial Co., 206 No. Laflin St., Chicago, Ill.
Colonial Bushings, Inc., 145 Jos Campau St., Detroit, Mich.

DRILL PRESSES—Single & Multiple Spindle
Buffalo Forge Co., 477 Broadway, Buffalo, N. Y.

ELEVATING TABLES—Portable
Hamilton Tool Co., The, 222 North B Street, Hamilton, Ohio.

END MILLS
Putnam Tool Co., 2985 Charlevoix, Detroit, Mich.
Weldon Tool Co., The, 3000 Woodhill Rd., Cleveland, Ohio.

ENGRAVING MACHINE — Pantographic
H. P. Preis Engraving Machine Co., 155-157 Summit St., Newark, N. J.

FILES—Hand
Grobet File Corp. of America, 3 Park Place, New York, N. Y.

FILES—Rotary
Grobet File Corp. of America, 3 Park Place, New York, N. Y.
Hamilton Tool Co., The, 222 North B Street, Hamilton, Ohio.

FILING MACHINES—Continuous
Continental Machine Specialties, Inc., 1301 Washington Ave., S., Minneapolis, Minn.
Grob Brothers, Grafton, Wis.

FORGINGS—General
Ajax Steel & Forge Co., 205 Adair St., Detroit, Mich.

FORGINGS—Water and Oil Hardening, High Speed, Special Alloy, Stainless and S.A.E. Steel
Forging and Casting Corp., Ferndale (Detroit), Michigan.

FORM TOOLS—For Screw Machines
Weldon Tool Co., 3000 Woodhill Rd., Cleveland, Ohio.

GAGES—Standard
Lincoln Park Tool & Gage Co., 1721 Ferris Ave., Lincoln Park, Mich.

GAGE BLOCKS
Ford Motor Co., Johansson Div., Dearborn, Mich.
The Webber Gage Co., 2517 Vestry Ave, Cleveland, Ohio.

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GRINDER—Portable Electric
Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago, Ill.

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Boyar-Schultz Corp., 2114 Walnut Street, Chicago, Ill.
Koestlin Tool & Die Corp., 3601 Humboldt Ave., Detroit, Mich.

GRINDER—Utility
Maxwell Company, F. A., 310 Broadway, Bedford, Ohio.

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Machinists Tool Grinding Co., 2836 W. Lake St., Chicago, Ill.
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Acme Industrial Co., 206 No. Laflin St., Chicago, Ill.
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H. P. Preis Engraving Machine Co., 155-157 Summit St., Newark, N. J.
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H. P. Preis Engraving Machine Co., 155-157 Summit St., Newark, N. J.
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Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago, Ill.
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Sommer & Adams Co., The, 18511 Euclid Ave., Cleveland Ohio.
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Carborundum Co., Niagara Falls, N. Y.
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Hovis Screwlock Co., 3129 Larned St., E., Detroit, Mich.
PUNCH PRESSES
Marshalltown Mfg. Co., 913 E. Nevada St., Marshalltown, Iowa.
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Wm. S. Yohe, 500 Mahoning Ave., Canton, Ohio.
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Putnam Tool Co., 2985 Charlevoix Ave., Detroit, Mich.
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Royal Oak Tool & Machine Co., 621 E., Fourth Street, Detroit, Mich.
REPAIR PARTS FOR MACHINERY
Enterprise Machine Parts Corp., 2731 Jerome Ave., Detroit, Mich.
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Hovis Screwlock Co., 3129 Larned St., E., Detroit, Mich.
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Master Chrome Service, Inc., 5911 Herman Ave., N.W., Cleveland, Ohio.
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Porter Steel Treating Co., The Geo. H., 1225 Marquette St., Cleveland, Ohio.
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McKinney Tool & Mfg. Co., The, 1688 Arabella Rd., Cleveland, Ohio.
SAWING MACHINES—Continuous
Continental Machine Specialties, Inc., 1301 So. Washington St., Minneapolis, Minn.
SAWING MACHINES—Open End
Grob Brothers, Grafton, Wis.
SCREW MACHINE PRODUCTS—Contract
Star Machine & Tool Co., 9320 Woodland Ave., Cleveland, Ohio.
Ulmer Co., The J. C., 1791 East 38th St., Cleveland, Ohio.
SCREW MACHINE PRODUCTS—Hardened & Ground
Acme Industrial Co., 206 No. Laflin St., Chicago, Illinois.
SCREWS—Socket Head
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.
Holo-Krome Screw Corp., The, Hartford, Conn.
Strong, Carlisle & Hammond Co., 1392 West Third St., Cleveland, Ohio.
SCRIBERS
Ford Motor Co., Johansson Div., Dearborn, Mich.
SHARPENING STONES
Carborundum Co., Niagara Falls, N. Y.
SHEARS—Bolt & Rivet—Automatic
Buffalo Forge Co., 477 Broadway, Buffalo, N. Y.
SINE BARS
Ford Motor Co., Johansson Div., Dearborn, Mich.
SPACERS—For Milling Machine Arbors
Detroit Stamping Co., 3443 West Fort St., Detroit, Mich.
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Hartford Special Machinery Co., Hartford, Conn.
SPRINGS—Die
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.
STAMPINGS
Barth Stamping & Mach. Works, W. 54th & Denison, Cleveland, Ohio.
Boehm Pressed Steel Co., The, 2225 West 63rd St., Cleveland, Ohio.
Davis Tool & Engineering Co., 6431 Epworth Blvd., Detroit, Mich.
Denning Mfg. Co., The, 1775-81 E. 87th St., Cleveland, Ohio.
Detroit Stamping Co., 3443 West Fort St., Detroit, Mich.
Modern Tool & Die Co., P. O. Box 2741, Cleveland, Ohio.
Rockford Die & Tool Wks., Inc., 1816 Seventeenth St., Rockford, Ill.
Star Machine & Tool Co., 9320 Woodland Ave., Cleveland, Ohio.
Star Tool & Die Works, 2522 24th St., Detroit, Mich.
Ulmer Co., The J. C., 1791 East 38th
Variety Machine & Stamping Co., The, 12695 Elmwood Ave., Cleveland, Ohio.
St., Cleveland, Ohio.
STEEL—Alloy
Columbia Tool Steel Co., 410 East 14th St., Chicago Heights, Ill.
Darwin & Milner, Inc., 1258-64 West Fourth Street, Cleveland, Ohio.
Wheelock-Lovejoy & Co., Inc., 130 Sidney St., Cambridge, Mass.
STEEL—Carbon
Columbia Tool Steel Co., 410 East 14th St., Chicago Heights, Ill.
Darwin & Milner, Inc., 1258-64 West Fourth Street, Cleveland, Ohio.
STEEL—Chromium
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STEEL—"Cobalt"
Darwin & Milner, Inc., 1258-64 West 4th St., Cleveland, Ohio.
STEEL—High Speed
Ajax Steel & Forge Co., 205 Adair St., Detroit, Mich.
Columbia Tool Steel Co., 410 East 14th Street, Chicago Heights, Ill.
Darwin & Milner, Inc., 1258-64 West 4th St., Cleveland, Ohio.
STEEL—Stainless
Ajax Steel & Forge Co., 205 Adair St., Detroit, Mich.

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Columbia Tool Steel Co., 410 E. 14th St., Chicago Heights, Ill.
Darwin & Milner, Inc., 1258-64 West 4th St., Cleveland, Ohio.
Wheelock-Lovejoy & Co., Inc., 130 Sidney St., Cambridge, Mass.

STEEL PLATE—Rough or Machined Torch Cut Shapes
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.

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Porter Steel Treating Co., The Geo. H., 1225 Marquette St., Cleveland, Ohio.

STRAIGHT EDGES
Ford Motor Co., Johansson Div., Dearborn, Mass.

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Lyons Machine Co., 5601 Tillman Ave., Cleveland, Ohio.

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Gerstner Tool Chests, 56 Columbia St., Dayton, Ohio.

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Precision Tool Co., The, Bridgeport, Conn.

TOOL HOLDERS
Weldon Tool Co., The, 3000 Woodhill Rd., Cleveland, Ohio.

TRANSMISSION UNITS
Ohio Ball Bearing Co., 6531 Euclid Avenue, Cleveland Ohio.

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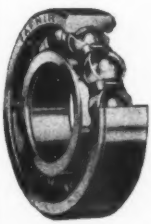
WASHERS—Special
Detroit Stamping Co., 3443 West Fort St., Detroit, Mich.

WELDING
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.
Oberly-Hautz Co., 1621 West 116th St., Cleveland, Ohio.
Star Tool & Die Works, 2522 24th St., Detroit, Mich.



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The Hovis Screwlock method for retaining punches is so simple that its advantages are obvious:

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The clamp is easily attached wherever it is desired, the clamping size being 1" x 1½". It should prove very useful at an inspection bench. Complete information may be had upon request to Continental Machine Specialties, Inc., 1303 So. Washington Avenue, Minneapolis, Minnestota.

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No. 1—These 2 stripper parts were cut on the Do-All, from 2 pieces of steel, with 75% saving over previous methods.

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TDM-10

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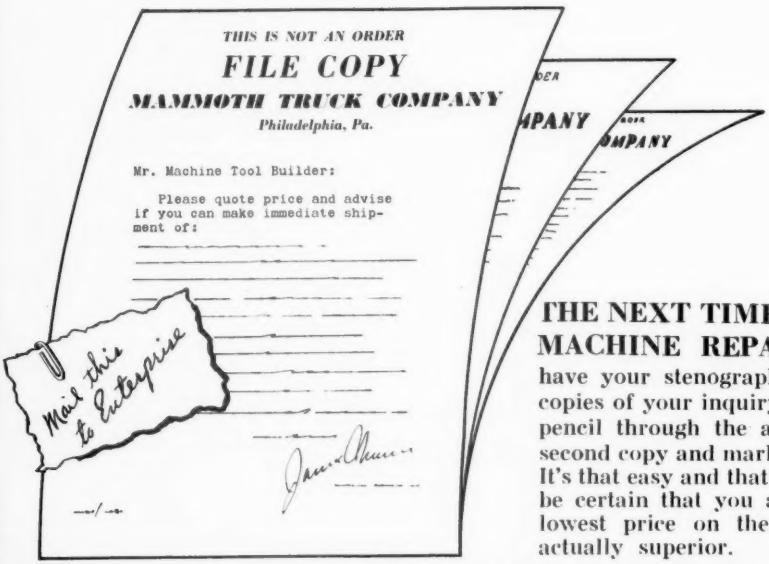
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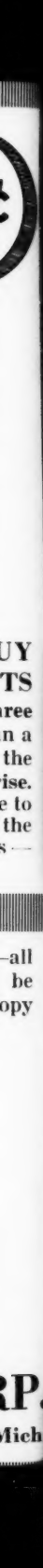
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